

Plant Series, No. 6. Manuscript MS408. Portfolio 4, Right (JPEG 009). Gerard E. Cheshire.**Abstract.**

The plants individually described in Manuscript MS408 have all been identified as species from the environs of the Mediterranean Basin, in accordance with the location of origin for the manuscript. This series of papers presents each plant species separately with a translation of its accompanying text and any relevant cross-reference information. In addition to the linguistic value, there is plenty of historical, cultural and scientific knowledge to be gleaned from each of these manuscript pages, so they will be of interest to scholars from various disciplines.

Manuscript MS408 originates from Castello Aragonese, Ischia. It was written as an *aide-memoire* for Maria of Castile, Queen of the Crown of Aragon, c. 1444, whilst her husband, Alfonso V, was conquering the City of Naples. The manuscript remained in the castle library until 1912 when the citadel was sold into private hands by the Italian government and its contents were removed and traded off. Two years later the document found its way out of Italy and the nation unknowingly lost an important part of its heritage.

Within the manuscript there is a series of illustrations of medicinal herbal plants with accompanying text. This project identifies the plant species and translates the text to reveal the information imparted by the author and artist of each entry. The algorithmic method, of priority array queuing, was used to translate and identify the words in the text, as described in the following paper: <https://ling.auf.net/lingbuzz/004653> The method takes Latin as the principal source, with Old and Modern Romance as the secondary and tertiary sources. We can see that the language is placed somewhere between Latin and Romance in linguistic evolutionary terms: i.e. it is a vestigial form of prototype Romance.

Palaeography from historic languages and writing systems is never an exact science, especially when both are unfamiliar, but the subsequent transliterations into English phrasing provide adequately legible intention of meaning. In addition, many of the words are unambiguous in their Latin root and the text cross-references with botanical and medicinal information about the plants described in the images, so serving to verify the methodology.

The plant images are naïvely and inaccurately drawn and coloured, as the artist was untrained and should be viewed as simplified cartoon representations rather than anatomical illustrations. The images also focus on the relevant medicinal or culinary parts of the plants, so that the specimens are often incomplete, disproportionate, unscaled and shown in varying stages of development from young seedlings to mature plants in seed. A few of the images also contain additional pictorial information or annotations to highlight particular points for identification.

Some of the plants would have been grown in the physic and vegetable gardens of Castello Aragonese or else collected from Ischia island. Others would have been purchased from herbal plant suppliers travelling from mainland Europe, as dead specimens collected in the field and preserved by desiccation. Tinctures and essential oils would also have been available for purchase. It is apparent that the illustrations essentially function in substitution for the plant names, simply because scientific names were not yet conceived, and common names would have varied regionally. So the combination of visual and written information was intended to enable the reader to identify the species and use them for medicine or food accordingly.

Plant Species.

Rosemary-heather. *Andromeda polifolia*.

This is a highly revealing manuscript page, as the first words of the text state that the plant was used for lona'réa (age-reversing) whilst the 18th century genus name *Andromeda* alludes to a Greek mythological story about the rescuing of youthful beauty. Until now it had been presumed that Carl Linnaeus (1707–78) had made the imaginary connection between the plants and the Greek mythology himself when he named the plant genus *Andromeda* in 1737, but the manuscript text demonstrates that he was referencing a long-established European folkloric belief about the plant, which has since been lost to time. Thus, it was not a fantastical flight of fancy on the part of Linnaeus at all, but rather a considered study of the plant in knowledge of the mythology and the medicinal folklore. So, Linnaeus chose *Andromeda* in allusion to traditional beliefs.

The full name Linnaeus gave to his holotype species was *Andromeda foliis aciformibus confertis* (Andromeda with crowded needle-form leaves), in *Flora Lapponica* (Flora of Lapland). In fact, the species Linnaeus described was *Andromeda hypnoides* (Mountain-heather), whilst the species illustrated in the manuscript is *Andromeda polifolia* (Rosemary-heather). This was described as *Andromeda foliis alternis lanceolatis margine reflexis* (Andromeda with alternating lanceolate leaves, with turned back edges). The former is from northern European latitudes only, whilst the latter is found as far south as the Pyrenees and the Alps, where it is found growing in acidic marshy conditions. It is a low-spreading shrub that holds its seed capsules as high as possible so that the wind carries the seed away from the parent plant. These are seen at the terminals of the branches in the manuscript illustration¹.

Linnaeus included a number of very similar species under his genus *Andromeda* that have since been assigned new genera. These include the *Cassiope* species (Don, 1834) and the *Phyllodose* species (Babington, 1843), whilst *Andromeda hypnoides* has become *Harrimanella hypnoides* (Coville, 1901). *A. polifolia* is now the sole species in its genus. It is also known as *A. glaucophylla* in North America, although it is sometimes considered to be a subspecies, or separate species, as it differs in a number of specific details². All genera are rather similar and botanists are still uncertain of their exact taxonomic relatedness.

The genus name *Andromeda* translates from Greek as 'ruler of men', Ἀνδρο-μέδα (Andro-méda), due to the seductive youthful beauty of the mythological figure. The species name *polifolia* was originally the genus name given to the plant by Johann Christian Buxbaum (1693–1730) in *Plantarum Minus Cognitum* (Plants Less Known) of 1728. Buxbaum had himself taken the name from *Historia Plantarum Universalis* (Complete History of Plants) by Johann Bauhin (1541–1612) and Johannes-Henricus Cherler (1570–1610), published posthumously in 1650. The word means 'polium-foliage' as *A. polifolia* has its foliage arranged in a similar linear way, along the stem, to Polium (*Teucrium polium*), which is another medicinal plant, from the Mediterranean. The alternative species name *glaucophylla* (glaucus-leaves) refers to the greyish-green leaf colour. Rosemary-heather is also known by various other vernacular names over Europe, such as Laurel-heather, Lavender-heather, Bog-rosemary, Marsh Andromeda and False Bog-myrtle.

The Linnean *Andromeda* genus was formerly known by a number of other names prior to Linnaeus. Pier Antonio Micheli (1679–1737) used the name *Ledum palustre*, which uses an abbreviation of the Greek term ledanum, in allusion to the medicinal resinous gum content of the plants, with palustre meaning bog or swamp. The aforementioned Bauhin and Cherler also used the word *Chamædaphne* in *Historia Plantarum Universalis*, which is Greek for 'ground-laurel'. The same name was used by Adam Lonicer (1528–86) in his *Herbal* of 1557. Joseph Pitton de Tournefort (1658–1708) used the Greek *Chamærhododendros*, which translates as 'ground-oleander'³.

In *Flora Lapponica*, Linnaeus explains the mythological source for his choice of genus name *Andromeda* using *A. hypnoides* as his model. He explains that the flower was thought to be like the forlorn bowing head of beautiful Andromeda, with slender neck and bowing head, and the branches like her arms reaching up to the heavens (where her mother Cassiopeia languishes), and the stem like her feet tied together in the water as she is tormented by the sea dragon Cetus, symbolized by a newt. Then her face deteriorates with anguish, but afterwards the fruits stand upright like the head of Andromeda escaping from the water after Perseus, represented by summer warmth, has slain the sea monster. Thus, we have the reason why the plant was

associated with Andromeda, and therefore believed to satisfy human vanity about ageing in the logic of Medieval folklore.

Here are the words of Linnaeus in Latin: "*Virgo hæc lectissima pulcherrimaque collo superbit alto et vividissimo (pedunculus), cujus facies roscis suis labellis (corolla) vel optimum veneris fucum longe superat; juncea hæc in genua projecta pedibus alligata (caulis inferior incumbens), aqua (vernali) cincta, rupi (monticulo) adfixa, horribus draconibus (amphibiis) exposita, terram versus inclinat mæstam faciem (florem), innocentissimaque branchia (ramos) cælum versus erigit, meliori sede fatoque dignissima, donec gratissimus Perseus (æstas) monstris devictis, eam ex aqua eduxit e virgine factam fœcundum matrem, quæ tum faciem (fructum) erectam extollit. Si Ovidio fabulam de Andromeda conscribenti hæc ante oculos posita fuisset planta, vix melius quadrarent attributa, qui more poetico ex humili tumulo produxisset Olympum.*"

Figure 1 shows a journal sketch made by Linnaeus to express his enthusiasm at finding agreement between the mythology, the medicinal folklore and what he observed in the field. In the sketch he compares the mythological story against the plant growing in its natural habitat to explain the symbolic connections. He even states '*ficta ie vera*' (fiction that is true). Coincidentally, Linnaeus happened to have a similar naïve drawing style to that of the manuscript artist.



Fig. 1. Journal sketch by Carl Linnaeus of 1734, drawn whilst on expedition to Mount Vallevare, on the border between Sweden and Norway. The words read '*Andromæda* (Andromeda), *ficta ie vera* (fiction that is true), *mystica ie genuinis* (mysticism that is genuine), *figurata ie depicta* (forms that are depicted). Note: the Latin *ie* (*i.e.*) stands for *id est* (that is, that are). The images compare the mythical scene of Andromeda chained to a rock and about to be killed by a sea dragon (left) with the flowering plant growing in a marsh and a newt alongside (right). Clearly the words and images show that Linnaeus was referencing known folklore about the plant, and to which the manuscript page also alludes.

Like *Atropa baetica*, described in Plant Series, No. 1., *Andromeda polifolia* was used in an effort to slow, halt or reverse ageing. However, unlike *Atropa*, which contains some highly noxious chemicals, Andromeda is relatively inert, indicating that its properties were largely a matter of belief and placebo: i.e. homeopathy. It does though, contain a variety of chemicals that possess antioxidant, antibacterial and anti-inflammatory properties, so it may be that frequent and regular consumption in bread, as described in the manuscript, had a long-term benefit on health, which may have slowed general ageing caused by metabolic oxidation and biotic infection^{4/5}.

Andromeda polifolia also contains a neurotoxin named grayanotoxin, which has been used as a recreational drug in parts of the Mediterranean, as it induces intoxication similar to a tranquilizer by causing hypotension (low blood pressure). So, it may be that the Ischia court enjoyed this sensation in association with eating the bread. (Ref: Fernald, M. L. (1916). A calciphile variety of *Andromeda glaucophylla*. *Rhodora*, 18(209), 100-102.). *Andromeda polifolia* was also one the plants traditionally used as a 'hop' for flavouring and improving the shelf-life of ale due to its preservative qualities. This may have reinforced the belief that it prevented aging, especially as it will have worked as a general antibiotic in the stomach⁶.

Translations.

1. lona'réa (age-reversing. Portuguese) épana [abb. épanalepsis: so they say, it is repeated. Latin, French] æior [abb. praeior. v. prae: prior, from before, from earlier. Latin] or æia [v. ora aeia/ehyéh (אהיה): now to be/to exist. Latin from Hebrew] 'dome'a [abb. hebdomeda: weekly. Latin] nous [us. Latin] é'os [it's for. Latin] amoa [abb. amoado: dough. Galician]
2. næos [v. naos (cella): granary. Latin] æor æor [abb. aeora, aeora: knead, knead. Latin from Greek] emeor [requires. Latin] æméa [v. améa: loving, caring, pleasant. Latin, Old Italian] éaus [v. éaux. holy waters. Old French] t [terminus. Latin] éos [they. Latin] aus [abb. austere: plain, dull. Latin] éasa [that is. Spanish]
3. ó'méor [way forward. Latin] éor [sister. Latin] éa [and. Portuguese] éaus [holy waters. Old French] domaus [subdue. Latin] naus [food. Vulgar Latin] æ'ais [abb. æ aise, eise: of ease. Old French]
4. doméor é'a ama [housekeeper who is the matron. Portuguese] naus [food. Vulgar Latin] o'laus [of praise. Latin] eme'a [acquire it. Latin]

Age-reversing, so it is repeated from the past, now to be weekly for dough in the granary, which is kneaded lovingly with holy waters. It is the way forward for those who have gone plain, to eat. The holy waters subdue and ease the food. The housekeeper who is the matron praises it to acquire as food.

Note: The word æia (aeia) is the Latin version of ehyéh, which is a Hebrew term, meaning to be, to exist, I'll be, and so on.

Note: The word amoado still means dough or batter in Galician, for making pancakes or drop scones. In Portuguese it has come to mean sweetheart, or loved one, as a euphemism due to the pleasure of eating filloa, which is a Medieval word for filled pancakes, in Old Galician and Old Portuguese.

Note: The work of Panfilo Sassi (c. 1455—1527) uses the word améa (loving, pleasant, desirable): *Opera Del Preclarissimo Poeta* (The Work of an Outstanding Poet) 1519. The word is still used in some regions of Italy. Sassi used a dialect that is Latin-Italian.

Note: The word æora is Latin from Greek for physical manipulation (gestatio). Here it means to knead the dough with water. Elsewhere it means to knead the pregnant belly in order to free the unborn baby.

Note: The word lona is a Portuguese euphemism, still used in Brazil, which means to 'age like a sail' as the literal meaning of lona is canvas, sailcloth, duck. Thus lona'réa means 'age reversing' in vernacular Lusophone.

Note: The genus name Cassiope alludes to Cassiopaea (Κασσιόπεια: Kassiopeia) from Greek mythology, who was known for her downfall due to her vanity and arrogance.

Note: The Latin word *domé* is derived from the Greek phrase (οἶκος δομές: *oikos domés*: home structures) for household, homestead – physical and social - thus *doméor* means householder, housekeeper, etc.

Note: The Latin word *éos* (they) belongs with *nōs* (we, us) and *vōs* (you).

Note: The word *epanalepsis* comes from the Greek ἐπανάληψις (*epanálēpsis*): *epana* (repeat) + *lepsis* (seizure) – to be stuck in repetition.

Note: The word *naos* comes from the Greek ναός which was originally the inner sanctum of a temple: i.e. a small room. It came to mean a pantry or granary: i.e. where bread was prepared.

5. *panaus domé'a* [v. *panais/panas*, abb. *hebdoméda*: bread weekly. or 'of house'. Portuguese, Latin] *na* [in. Portuguese] *m* [abb. *memoriae*: remember. Latin] *ana* [medicine in a regular dose. Italian]
6. *é'os* [it is. Latin] *æa* [magic. Latin] *méa na* [half in. Latin] *méga* [v. *mée/maie*. kneading or mixing bowl or trough, to mate, meet or mould together. French]
7. *domaus* [v. *domás*: break in, work in. Portuguese, Spanish] *eme'or* [to acquire. Latin] *naus* [food. V Latin] *eme'osa* [f. prone to procuring. Latin]
8. *æos* [v. *eos*: them. Latin] *æor æor* [abb. *æora*, *æora*: knead, knead: Latin from Greek] *emea* [to acquire. Latin] *epe'orna* [v. *epa orna*: furnish the belly]
9. *naus* [food. V Latin] *ele'o'éa* [it of is. Portuguese] *méa* [half-full, half-empty. Old Portuguese] *los aus* [abb. *los ausente*: them missing, absent: Portuguese]
10. *onar* [abb. *antiphonar*: a liturgical chant. Latin] *æos* [v. *a os*. to be. Portuguese] *æa* [magic. Latin] *æor* [abb. *æora*: knead. Latin from Greek] *epe'aus* [v. *epa austerus*: harsh/dry/sour bellies. Latin, Italian]
11. *doméous* [those of the household. Latin] *æia* [v. *æia/ehyéh* (אהיה): to be/to exist. Latin from Hebrew] *s* [sacrum: sacred, holy. Latin] *doma* [verb form of *domar*: to tame, control. Portuguese, Catalan]
12. *tous* [all. French] *éaus éaus* [v. *éaux*, *éaux*: holy waters, holy waters. Old French]
13. *naus* [food. V Latin] *emeia* [to acquire. Latin]

Bread of house to remember as a regular dose of medicine it is magic, half-measure in the mixing trough and work-in to acquire the food by kneading it to furnish the belly. The food it is half-complete as it is missing liturgical chants to become magic and manipulation of the sour bellies of the household to be sacredly controlled, all with holy waters and more holy waters with the food.

Note: The word *panaus* (bread) survives in Portuguese as *panas*, where it means food that is breaded, or coated in breadcrumbs. Thus, the herbal medicine is breaded by mixing with *amoad* (dough/batter).

Note: The word *doméa* is 'domé a' (of the house), whilst the word *domea* is 'dome'a' an abbreviation of *hebdomeda* (weekly) from the Greek ἐβδομάς (*ebdomás*) which means the number seven: i.e. seven days.

Note: The *éaus* (holy waters) from the hot spas of Ischia were known as *aquæ fluventa* (waters of youth), so they would have been imbibed to wash down the age-reversing herbal medicine. The word *fluventa* is an interesting marriage of *fluvius* (river) and *entisol* (tufa) as the hot spa waters were seen to preserve the surfaces of rocks by depositing smooth calcareous minerals on the rough surface of rocks, rather like a new and youthful skin. On the causeway from Castello Aragonese to Ischia Island, water is described by the Latin word *aqua*, indicating a distinction between the two: i.e. *éaus* is potable freshwater, *aqua* is saline seawater.

Note: The word antiphonar refers to a liturgical chant from the antiphonarium, in order to imbue the medicine with holy powers: described as æa (magic).

Note: The word méa means half-full, half-empty in Old Portuguese, whilst the word mea means me, my, mine in Latin. For example: 'méa hora' means 'half an hour'⁷.

In Summary.

Age-reversing, so it is repeated from the past, now to be weekly for dough in the granary, which is kneaded lovingly with holy waters. It is the way forward for those who have gone plain, to eat. The holy waters subdue and ease the food. The housekeeper who is the matron praises it to acquire as food.

Bread of house to remember as a regular dose of medicine it is magic, half-measure in the mixing trough and work-in to acquire the food by kneading it to furnish the belly. The food it is half-complete as it is missing liturgical chants to become magic and manipulation of the sour bellies of the household to be sacredly controlled, all with holy waters and more holy waters with the food.

Conclusion.

The addition of the plant to bread was clearly considered to be an age-reversing elixir, along with the Ischia spa waters which were believed to have magical rejuvenating powers. Growing old and plain has been a concern of women since time immemorial. In the Medieval period being usurped by young and beautiful girls might have resulted in destitution as well as wounding one's self-esteem, so it paid to preserve one's appearance by any means available. Linnaeus would have been fascinated to read an account of the use of *Andromeda* in accordance with the folklore to which he alluded in naming the plant.

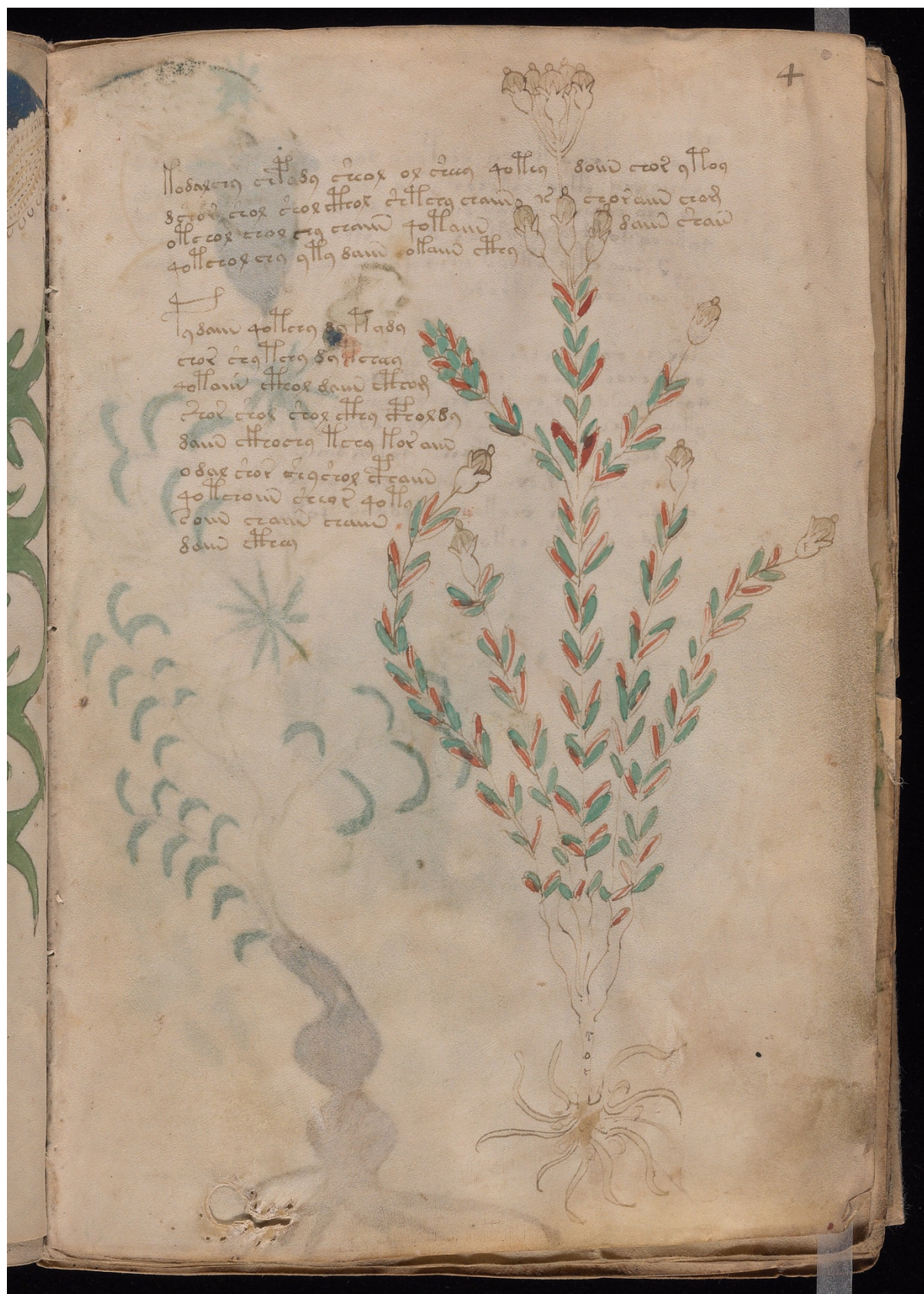


Fig. 2. Rosemary-heather. *Andromeda polifolia*. Portfolio 4, Right. The plant is shown in seed, with varying numbers of capsules at the terminals of the branches, which is characteristic of the species.



Figure 3. Various images of Rosemary Heather (*Andromeda polifolia*) growing in its natural setting and bearing fruits as shown in the manuscript image.



Figure 4. 1728 engraving of *Andromeda polifolia* in flower, from *Plantarum Minus Cognitum* (Plants Less Known) by Johann Christian Buxbaum.



Figure 5. 1886 print of *Andromeda polifolia* in flower and in fruit, from *Flora von Deutschland, Oesterreich und der Schweiz* (Flora of Germany, Austria and Switzerland) by Otto Wilhelm Thome.



Figure 6. 1813 lithograph of *Andromeda polifolia* in flower and in fruit, from *Getreue Darstellung und Beschreibung der in der Arzneykunde gebräuchlichen Gewächse wie auch solcher, welche mit ihnen verwechselt werden können*. (Faithful representation and description of the plants used in medicine as well as those that can be confused with them) by Friedrich Gottlob Hayne.



Figure 7. 1800 lithograph of *Andromeda polifolia* in flower and in fruit, from *Icones Plantarum Medico-Oeconomico-Technologicarum cum Earum Fructus ususque Descriptione* (Images of Plants Medicinal Economic and Technological, Descriptions of Their Use for Personal Profit) by Ferdinand Bernhard Vietz. Note that the plant is called Falscher Porst (False Bog-Myrtle) in German.

Discussion.

The manuscript image of *Andromeda polifolia*, seen in Fig. 2, portrays a few diagnostic features of the plant that can be seen in the photographs in Fig. 4 and in the illustrations, Figs. 5-7. The plant has erect wiry branches lined with whorls of lanceolate leaves, coloured green with touches of red. The fruits are held on erect peduncles at the tips of the branches, in varying numbers. The fruits themselves are segmented and globular berries, with protruding finials and mounted on calyxes.

Finally, in the manuscript image the root is drawn as a kraken, which is a mythical giant squid-like sea monster, as befits the story of Andromeda. In addition, the outlines of two human torsos are seen each side of the stem, representing the mythical characters, Andromeda and Perseus, and the word *t o a* (toa) is written vertically down the stem, which is an Old Portuguese word for a warp or rope used for mooring ships or as an anchor line; used as a euphemism for attraction: i.e. being bound or tied together by love⁸.

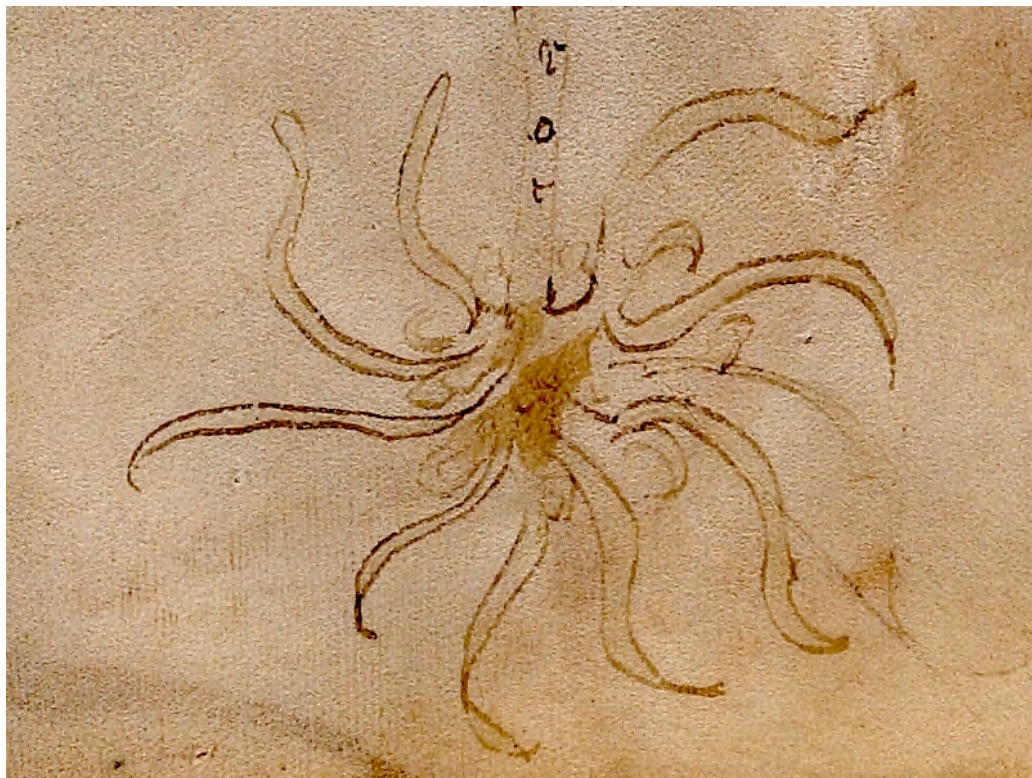


Figure 8. Details of *Andromeda polifolia* root, from the manuscript illustration. The root is drawn as a kraken sea monster – a giant cephalopod with ten arms (a mythical squid). On each side of the stem we can see outline images of the lovers Andromeda and Perseus, with the Old Portuguese word ‘toa’ written vertically on the plant stem between them, to indicate their bond of affection.

As it happens Linnaeus included the kraken in his 1735 work *Systema Naturæ* (System for Nature), when the mythical monster was still believed to be real, calling it *Microcosmus* (small cosmos) due to its legendary size. The name is now used for a Mediterranean sea-squirt. The real giant squid is known as *Architeuthis dux*, but it is no monster.

Although Cetus is more often portrayed as a sea serpent, amphibian or fish-like creature, the word cetus is derived from the Greek *ketos* (κῆτος) which means abyss, so it simply means any monster from the deep sea. The word kraken is derived from the Old Germanic *krakona* (to scream with fear). In a different mythical tale it is Heracles who kills Cetus to save Hesione, Princess of Troy⁹.

References.

1. Jacquemart, A. L. (1998). *Andromeda polifolia* L. *Journal of Ecology*, 86(3), 527-541.
2. Fernald, M. L. (1903). *Andromeda polifolia* and *A. glaucophylla*. *Rhodora*, 5(50), 67-71.
3. Hill, John. (1773). *A General Natural History of the Animals, Vegetables and Minerals*. St. James' Street. London.
4. Chung, S. G., Ahn, B. Z., & Pachaly, P. (1980). Constituents of *Andromeda polifolia*. *Planta Medica*, 38(3), 269-270.
5. Pachaly, P., & Klein, M. (1987). Constituents of *Andromeda polifolia*. *Planta medica*, 53(5), 442-444.
6. Howarth, L. (2002). *Home Brewer's Recipe Database*. Lulu. ISBN: 978-1-329-79284-5.
7. Janeway, Abraham. (1701). *A Compleat [sic.] Account of the Portugueze Language*. Published by Richard Janeway. London. <https://books.google.co.uk/books?id=epANAAAAQAAJ&pg>

8. Vieyra, Antonio. (1773). *A Dictionary of the Portuguese and English Languages, in Two Parts*. J. Nourse. London. <https://books.google.co.uk/books?id=yQktAAAAAYAAJ&pg=PP647&lpg>
9. Bryant, Jacob. 1807. *An Analysis of Antient [sic.] Mythology*. Jacob Bryant. Walker et al. London.

Further reading:

1. Plant Series, No. 1. *Atropa baetica*. <https://ling.auf.net/lingbuzz/004797>
2. Plant Series, No. 2. *Serratula erucifolia*. <https://ling.auf.net/lingbuzz/004845>
3. Plant Series, No. 3. *Nymphaea alba*. <https://ling.auf.net/lingbuzz/004864>
4. Plant Series, No. 4. *Euphorbia myrsinites*. <https://ling.auf.net/lingbuzz/004880>
5. Plant Series, No. 5. *Hesperocodon hederaceus*. <https://ling.auf.net/lingbuzz/004917>
6. The Language and Writing System of MS408 (Voynich) Explained. <https://www.tandfonline.com/doi/full/10.1080/02639904.2019.1599566>
7. Linguistic Missing Links. <https://ling.auf.net/lingbuzz/003737>
8. Linguistically Dating and Locating Manuscript MS408. <https://ling.auf.net/lingbuzz/003808>
9. Consonants & Vowels, Castles and Volcanoes. <https://ling.auf.net/lingbuzz/004381>
10. The Algorithmic Method for Translating MS408 (Voynich). <https://ling.auf.net/lingbuzz/004653>

Symbol key for Manuscript MS408. Gerard Edward Cheshire. University of Bristol. www.sciencesurvey.link

Symbol-Italic key for MS 408.			
Symbol	Italic	Symbol	Italic
a	a (trapped)	9	a (free)
aw	ais	aw	aus
æ	æ (ae, a, e, i)	4	d
c	e (short)	cc	e'e (intonation)
æ	é (long)	ç	i
ll	l (ll)	ele	ele (elle)
mm	m (mm)	eme	eme (emme)
n	n (nn)	o	o
p	p (pp)	epe	epe (eppe)
qu	qu	eque	eque
r	r (rr)	s/z	s/z (ss, zz)
s/z	s/z (ss, zz)	sa/za	sa/za
t	t (tt)	ta	ta
u	u	v, f, fv, ph, pv	v, f, fv, ph, pv